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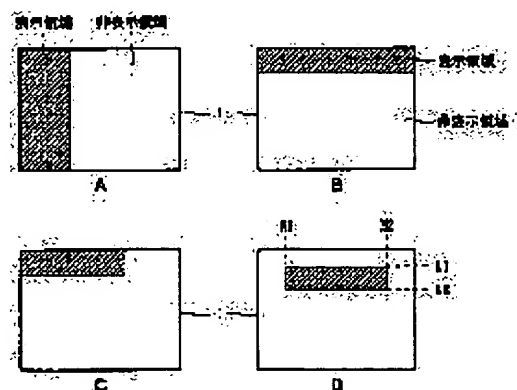
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(54) LIQUID CRYSTAL DEVICE AND ELECTRONIC EQUIPMENT

(57)Abstract:

PROBLEM TO BE SOLVED: To set freely a partial display area to a certain extent for a device user in a liquid crystal display device having a function making only a partial part of a screen a display state and making a remaining part a non-display state.

SOLUTION: When an area to be partially displayed is made the surrounded area from L1-th row to L2-th row and from M1-th column to M2-th column of a liquid crystal display panel 1, a register is provided in a control circuit, and values corresponding to L1, L2, M1, M2 are made to be written in beforehand to be partially displayed according to the values written therein.



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CLAIMS

[Claim(s)]

[Claim 1] Liquid crystal equipment which is liquid crystal equipment with the function which makes some fields a display state and makes other fields a non-display state, and is characterized by carrying out adjustable [of the position of a viewing area or a non-display field] with the register of a control circuit.

[Claim 2] Liquid crystal equipment which the partition of a viewing area and a non-display field is the direction classified by the signal electrode in the liquid crystal equipment of a claim 1, and is characterized by having a means to fix the applied voltage to the signal electrode of a non-display field to the voltage from which a display will be off, and a means to stop a transfer of the indicative data corresponding to a non-display field.

[Claim 3] Liquid crystal equipment which the partition of a viewing area and a non-display field is the line writing direction classified by the scanning electrode in the liquid crystal equipment of a claim 1, and is characterized by time impressing selection voltage to the scanning electrode of a viewing area by the case where it displays on the case where it displays on all lines, and some lines being the same.

[Claim 4] Liquid crystal equipment characterized by having the means which writes the applied voltage to the liquid crystal of the pixel section of the line which a pixel electrode is formed in a display panel in the shape of a matrix, comes to form the pixel section in the liquid crystal equipment of a claim 3, comes to form a switching element in the aforementioned pixel electrode, and is in a non-display field in simultaneously 0V.

[Claim 5] Electronic equipment characterized by carrying the aforementioned liquid crystal equipment.

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to liquid crystal equipment with the function which can make only some fields a display state and can change other fields into a non-display state.

[0002]

[Description of the Prior Art] The number of display dots is increasing the display used for pocket electronic equipment, such as a cellular phone, every year so that more information can be displayed, and the power consumption by display has also been increasing in connection with it. Since the power supply of pocket electronic equipment is a cell, it is called for strongly that it is a low power as a battery life is made for a long time. Therefore, although a full screen is made into a display state in display with many display dots when required, the method of making only some fields of a display panel into a display state at the time, so that a necessary minimum display can be performed, changing other fields into a non-display state, and reducing power consumption is usually beginning to be examined.

[0003] Although there are many things with the function which can control a display / un-displaying in the conventional liquid crystal display, the thing with the function which makes only a field with a screen a display state and changes other fields into a non-display state is not put in practical use yet. [of a full screen] As a method of realizing such a function, the example 1 and JP,7-281632,A of JP,6-95621,A are proposed. Both of these conventional examples have described the case where a liquid crystal display panel is a simple matrix method.

[0004] The example of JP,6-95621,A is explained below using drawing 7 and drawing 8. Drawing 7 is the block diagram of the liquid crystal display of this example. Block 51 is a liquid crystal display panel, at the interval which is several micrometers, the substrate in which two or more scanning electrodes were formed, and the substrate in which two or more signal electrodes were formed counter, and are arranged, and liquid crystal is enclosed with the gap. Block 55 is a Y driver which drives a scanning electrode, and block 56 is an X driver which drives a signal electrode. two or more voltage levels required for the drive of liquid crystal are formed in the driver voltage formation circuit of block 54 -- it is impressed by the liquid crystal display panel via X driver and Y driver Block 57 is a scanning control circuit which controls the number of scanning electrodes which should be scanned. Block 52 is a LCD controller which forms a timing signal required for those circuits, the data signal for a display, and a control signal, and block 53 is the source of an electric power supply of the above circuit. Selection voltage is impressed one line at a time to a scanning electrode one by one, and non-choosing voltage is impressed to other lines. The signal level according to ON/OFF of each pixel of the line chosen is impressed to a signal electrode one by one.

[0005] This example has described the case of the upper half of them as the case where sector display is a left half screen, further. The case where sector display is a left half screen first is explained. The number of signal electrodes is set to 640. Before shifting to the sector display state of a left half screen, all the pixels for one line write the data of OFF in X driver. Then, a LCD controller transmits only the indicative data for 320 pixels of 1 in all ends of a road to it while it makes double precision the period of the clock CLX which operates the shift register inside X driver and reduces by half the number of clocks in 1 selection period. Since the circuit which memorizes the indicative data for one line is built in X driver at this time even if only the amount of [of a left half screen] 320 pixels are as for data transfer, the right half of X driver continues memorizing the data of the OFF transmitted previously, and the output of 320 in the right half of X driver continues outputting the voltage which turns off a display. In this way, a right half screen can be made into an OFF display state. As for the power consumption of display, by the bird clapper, the half of that the clock frequency of X driver of operation is halved and a panel decreases a little compared with the case of a full-screen-display state to an OFF display.

[0006] Next, sector display explains the case of only the upper half of the left half screens. The number of scanning electrodes is set to 400. Only a left half screen is made into a display state by the method first mentioned above. Then, a LCD controller makes the sector display control signal PD "H" level, and

makes a lower half a non-display state. A full screen will be in a display state by scanning all scanning electrodes by 1/400 duty, when PD is "L" level, and when PD is "H" level, the bottom half screen of the remainder [screen / Johan] in a display state will be in the sector display state of a non-display state by scanning only the scanning electrode in the upper half of a panel by 1/200 duty. The change to 1/200 duty is performed by changing the period of the clock CLY which operates the shift register inside Y driver to double precision, and reducing by half the number of clocks within an one-frame period.

Although the detail of the scanning halt method of the scanning electrode of the bottom half screen in a sector display state is not indicated, it is the way the data transmitted to the 201st step from the 200th step of the shift register in Y driver are fixed to "L" level when PD is made into "H" level judging from the internal-circuitry view of the scanning control circuit block 54, consequently the 201st - the 400th output of Y driver maintains a non-choosing voltage level.

[0007] ON/OFF state of a pixel are decided by actual value of the voltage which joins liquid crystal. The effective voltage which joins the liquid crystal of a bottom half screen becomes quite smaller than the effective voltage which joins the liquid crystal which is in the OFF display state of upper right 1 / 4 screen, in order for selection voltage not to join a scanning electrode at all, consequently a bottom half screen is non-display completely.

[0008] In addition, in changing display duty in the liquid crystal display panel of a simple matrix method, setting change of driver voltage is needed. This point is explained using drawing 8 which is the internal circuitry of the driver voltage formation block 53 below.

[0009] The composition and the function of drawing 8 are described first. The voltage of 6 level of V0-V5 is needed for driving the liquid crystal display panel of high duty rather than about 1/30 duty. The maximum voltage impressed to liquid crystal is V0-V5, and uses the input power voltage of +5V for V0 as it is. The voltage V5 to which contrast becomes the optimal from the input power of 0V and -24V with the variable resistance RV 1 and the transistor Q1 for contrast adjustment is taken out. The voltage of V0-V5 is pressured partially by resistance R1-R5, middle voltage is formed, drive capacity is raised for those middle voltage by operational amplifiers OP1-OP4, and V1-V4 are outputted. Switch S2a and S2b are interlock switches, and one of R3a and the R3b will be in a connection state according to the level of Signal PD. By changing the resistance of R3a and R3b, V0-V5 of a different division ratio according to the level of PD can be formed.

[0010] A relation between V0-V5 called $V0-V1=V1-V2=V3-V4=V4-V5$ is, and voltage split ratio $(V0-V1)/(V0-V5)$ is called bias ratio. When setting duty to 1-/N, it is indicated in JP,57-57718,B that a desirable bias ratio is $1/(1+\sqrt{N})$. Therefore, if the resistance of R3a and R3b is respectively set as 1/object for 400 duty, and 1/object for 200 duty, in each duty, it can drive by the desirable bias ratio.

[0011] When changing duty, not only the change of a bias ratio but driver voltage =V0-V5 need to be changed simultaneously. If duty is changed to 1/200 from 1/400, with driver voltage fixed, even if it changes a bias ratio to a desirable value, contrast will become a bad remarkable display. Since the time when selection voltage has joined liquid crystal becomes double precision, this is because the effective voltage which joins liquid crystal becomes high too much. About the need and its realization means of a driver voltage change, there is no detailed publication to the need and its realization means of a change of a bias ratio being indicated in detail by this example.

[0012] If duty is specifically set to 1-/N, in the case of $N \gg 1$, it is necessary to adjust V0-V5 in proportion to \sqrt{N} mostly. For example, if V0-V5 [optimal] in the case of 1/400 duty are set to 28V, in the case of 1/200 duty, it is necessary to adjust V0-V5 $28V/\sqrt{2} \approx 20V$. Although this voltage adjustment will be performed when an equipment user adjusts the variable resistance RV 1 for contrast adjustment to each time which changes a full-screen-display state and the Johan screen-display state, it is a very inconvenient thing for an equipment user. Although the addition of a driver voltage automatic setting means is indispensable, since a bias ratio change means is not easy, a driver voltage formation circuit will be complicated sharply.

[0013] If duty is changed according to it when sector display is quite as small as - of about ten lines 20 line order, a desirable bias ratio will be set to one third or 1/4. In the case of not 6 level but 1/4 bias, in the case of 5 level and 1/3 bias, voltage required for the drive of liquid crystal serves as 4 level.

Although what is necessary is just to set to 0 ohm the resistance of the side connected at the time of the sector display of R3a and the R3b when the voltage of 5 level is required, when the voltage of 4 level is required, the means which sets not R3* but R2 and R4 to 0 ohm is needed. Although the example has described JP,7-281632,A about the change means of the bias ratio in such a case, and the change means of driver voltage, the explanation beyond this of the example is omitted here.

[0014]

[Problem(s) to be Solved by the Invention] The function itself which makes a display state only some fields of a liquid crystal display panel, and changes other fields into a non-display state by the method which was mentioned above, and which is proposed until now becomes possible. However, since it will be limited only to a setup for which the field which can carry out sector display is prepared, it is accompanied by the fault that versatility is very scarce that the period of a clock must be changed or a bias ratio and driver voltage must be changed corresponding to the field which carries out sector display.

[0015] A liquid crystal driver has many which have the display OFF function with the control-input terminal. Although the method of setting up the field of sector display per IC chip by controlling individually the display OFF control input for every driver IC using the function is also possible, since it will be limited only to a setup for which the field which can carry out sector display too is prepared, it is the way versatility is missing.

[0016] Then, this invention aims to let the field of sector display offer the high liquid crystal display of the versatility which can be set up in soft.

[0017]

[Means for Solving the Problem] Liquid crystal equipment according to claim 1 is liquid crystal equipment with the function which makes some fields a display state and makes other fields a non-display state, and is characterized by carrying out adjustable [of the position of a viewing area or a non-display field] with the register of a control circuit.

[0018] For example, when making the field which carries out sector display into the field where from [M1 train] to [M2 train] was L1 line surrounded [of the display dot] to L2 line, it is technically possible to form the register in the control circuit and to enable it to write in the value corresponding to L1, L2, M1, and M2 and to carry out sector display according to the value written in there. Since the liquid crystal equipment with such a means can set up considerably the field which carries out [user] sector display freely, it becomes what has high versatility.

[0019] The partition of a viewing area and a non-display field is the direction classified by the signal electrode, and liquid crystal equipment according to claim 2 is characterized by having a means to fix the applied voltage to the signal electrode of a non-display field to the voltage from which a display will be off, and a means to stop a transfer of the indicative data corresponding to a non-display field.

[0020] The period of the data transfer clock for a display is made the same as that of the time of a full screen display also by the time of sector display, and the versatility in the case of calling it the direction where the partition of a viewing area and a non-display field is classified by the signal electrode by the method of stopping either [at least] a data transfer clock or data can be maintained in the data transfer period of a non-display portion.

[0021] The partition of a viewing area and a non-display field is the line writing direction classified by the scanning electrode, and liquid crystal equipment according to claim 3 is characterized by time impressing selection voltage to the scanning electrode of a viewing area by the case where it displays on the case where it displays on all lines, and some lines being the same.

[0022] The versatility in the case of calling it the direction where the partition of a viewing area and a non-display field is classified by the scanning electrode by the method of making time impressing selection voltage to the scanning electrode of a viewing area also in the time of sector display, a bias ratio, and driver voltage the same as the time of a full screen display can be maintained.

[0023] Liquid crystal equipment according to claim 4 is characterized by having the means which writes the applied voltage to the liquid crystal of the pixel section of the line which a pixel electrode is formed in a display panel in the shape of a matrix, comes to form the pixel section, comes to form a switching

element in the aforementioned pixel electrode, and is in a non-display field in simultaneously 0V.

[0024] In order for a non-choosing period to continue holding the voltage of the pixel section, before shifting to a sector display state, in the case of active matrix methods, such as TFT and MIM, it is necessary to write OFF state voltage in the pixel of a undisplayed line, although the line can be changed into a non-display state only by impressing non-choosing voltage to a scanning electrode in the case of a simple matrix method. If it writes in 0V, it will become unnecessary [an alternating current drive peculiar to liquid crystal]. The versatility in the case of calling it the direction where the partition of a viewing area and a non-display field is classified by such means by the scanning electrode also in the liquid crystal equipment of an active matrix method can be maintained.

[0025]

[Embodiments of the Invention] Hereafter, the operation gestalt of this invention is explained based on a drawing. Drawing 1 is drawing showing the sector display state in the liquid crystal equipment of this invention, and the display state and the white portion are [the slash portion] non-display. Although a white portion will also be in a display state when required, at the time of standby, it will be in the state of displaying only on some fields of the liquid crystal display panel 1 as shown in drawing.

[0026] When the partition of a viewing area and a non-display field is the direction where drawing 1 B is classified by the scanning electrode when drawing 1 A is a direction where the partition of a viewing area and a non-display field is classified by the signal electrode, drawing 1 C and D is drawings having shown the case where it was based on the combination. The direction classified by the signal electrode is henceforth expressed as the direction of a train, and it expresses the direction classified by the scanning electrode as a line writing direction. The size and position of the field which carries out sector display can be set up through the value set as the register inside a control circuit (LCD controller) so that the following examples may describe.

[0027] Drawing 2 is the block diagram showing the composition of the liquid crystal display of this invention. For the source of an electric power supply, and 4, a driver voltage formation circuit and 5 are [1 / a liquid crystal display panel and 2 / a LCD controller and 3 / the driver for a scanning electrode drive and 6] the drivers for a signal-electrode drive. Since the base element is the same as that of drawing 6 explained with the conventional technology, explanation of each element is omitted. Together with the content of each signal, an individual example explains the function of the LCD controller which is the point of this invention. In addition, drawing, although the LCD controller is expressed as an independent circuit block, it may be built in one of driver IC chips.

[0028] (Example 1) The example of the method of realizing a sector display state like drawing 1 A is explained using drawing 3 and drawing 4 . Drawing 3 is the circuit diagram having shown some LCD controllers built in a liquid crystal display, and is a circuit block which controls the sector display state of the direction of a train. Moreover, drawing 4 is the timing chart showing operation of the circuit of drawing 3 .

[0029] 7 is an about 8-bit register and the information corresponding to the number of trains which carries out sector display to the information on whether sector display of the direction of a train is performed is set up. Usually, what is necessary is just to set the number of data transfer clocks corresponding to the number of trains of sector display to a register 7, since the indicative data for two or more dots is transmitted for every clock of the clock for data transfer. If there are 7 bits supposing the indicative data for 8 dots is transmitted for every data transfer clock, the sector display to 27x8 dots = 1024 dots can set up per 8 dots.

[0030] 8 is the circuit block which makes a counter a subject, and forms the scanning start signal FRM, the indicative-data latch signal LP, a timing signal called the clock CLXI for data transfer, and the timing signals CNT1 and CNT2 which control the sector display of the direction of a train based on the set point of a register 7. FRM, LP, and CLXI are timing as shown in drawing 4 . In order to make drawing intelligible, the twist also actually showed the number of clocks of CLXI for every LP round term few. For example, by 8 dots, the number of display dots of the direction of a train is [320 and the indicative-data transfer of the number of clocks of CLXI for every LP round term] 40, when parallel. CLXI and DataI are signals which become a clock for data transfer, and an indicative data, when it is not

sector display. CLX and Data are the signals sent out to the driver for a signal-electrode drive from a LCD controller, and are a clock for data transfer, and an indicative data respectively.

[0031] t1 of drawing 4 shows the time which cuts and changes to the state of sector display from the state which is not sector display. If it says correctly, processing of sector display will begin from t1.

[0032] Before t1, CNT1 and CNT2 are H level regularly, they become that the AND gates 9 and 10 opened with as at this time, and the same signal as CLXI and DataI is respectively sent out to CLX and Data as it is. It is made for CNT1 and CNT2 to become the signal of timing like [on the right-hand side of drawing 4] in the state of sector display, so that CLX and Data corresponding to a non-display portion may stop.

[0033] The period which has chosen one certain line, i.e., one period of LP, is expressed as 1H period. Although X driver outputs the voltage according to the indicative data of each dot in the line while a certain line is chosen, the transfer to X driver of the indicative data of the line is performed between in front of 1H rather than it. Since, as for 1H [immediately after setting FRM and LP to H level], the 1st line is chosen, the indicative data of the 1st line is transmitted before the 1H to X driver. It is necessary to also transmit the OFF indicative data of the portion made non-display as an indicative data of the 1st line with the data of the portion to display. Therefore, since the number of clocks which sends the data for all the dots of one line like t1 or before is required for CLX of a 1H period just behind t1, i.e., the period which has transmitted the indicative data of the 1st line, CNT1 is taken as H level in the meantime. On the other hand, CNT2 of this 1H period fixes an indicative data to L level as L level, only while transmitting an OFF indicative data.

[0034] Since X driver will continue memorizing the data of the OFF previously transmitted about the portion without data transfer if only 1 H just behind t1 carry out such data transfer, even if it does not perform data transfer of the period corresponding to a non-display portion, a non-display portion can be made into an OFF display state after it.

[0035] Sector display called the direction where the partition of a viewing area and a non-display field is classified by the signal electrode like drawing 1 A by the above method is made. According to this example, it is made to correspond to the value which sets the size of sector display as a register, for example, can carry out adjustable freely per 8 dots.

[0036] In addition, it is more desirable to stop both like this example, although sector display was possible also for stopping one side of CLX corresponding to a non-display portion and Data in the state of sector display in respect of low-power-izing.

[0037] Although the method described above is an example in case the sector display section begins from the head train of a display panel, if it enables it to set the value corresponding to the start train and end train of the sector display section for a register as 2 system successive installation **** of each, not only the size of the direction of a train of the sector display section but a position can be set up freely. However, the period corresponding to the non-display section from the head train of a display panel to before the start train of the sector display section needs to operate CLX in this case.

[0038] (Example 2) The example of the method of realizing a sector display state like drawing 1 B is explained using drawing 5 and drawing 6 . Drawing 5 is the circuit diagram having shown some LCD controllers built in a liquid crystal display, and is a circuit block which controls the sector display state of a line writing direction. Moreover, drawing 6 is the timing chart showing operation of the circuit of drawing 5 . A display panel is been the line sequential drive per line, there are 200 lines in all, and the case where only 32 lines was displayed from a head in the state of sector display was shown. In drawing 6 , the portions of A and B are drawings about the case of the liquid crystal display of a simple matrix method and an active matrix method respectively.

[0039] 11 is an about 8-bit register and the information corresponding to the line count which carries out sector display to the information on whether sector display of a line writing direction is performed is set up. If line count is set up by 7 bits, by the panel of the line sequential drive per line, the sector display to $2^7 = 128$ lines can set up per one line, and the sector display to $2^7 \times 4 = 512$ line can set up per four lines by the panel of a four-line simultaneous selection drive.

[0040] 12 is the circuit block which makes a counter a subject, and forms the scanning start signal FRM,

a timing signal called the clock CLYI for a scanning signal transfer, and the timing signals PDY and CNT3 which control the sector display of a line writing direction based on the set point of a register 11. FRM and CLYI are timing as shown in drawing 6. CLYI is a signal used as the clock for a scanning signal transfer, when it is not sector display. CLY is a clock for a scanning signal transfer sent out to Y driver from a LCD controller, and the AND output of CNT3 and CLYI by the AND gate 13 serves as CLY.

[0041] Usually, Y driver has the control input which forbids the output of selection voltage. PDY is a signal used as such a control input of Y driver, at the time of L level, the output of selection voltage shall be forbidden and the full power of Y driver shall be set to a non-choosing voltage level.

[0042] t2 of drawing 6 shows the time which cuts and changes to the state of sector display from the state which is not sector display. If it says correctly, processing of sector display will begin from t2. The next one-frame period is expressed in F1 and a pan as F2 for the one-frame period just behind t2.

[0043] Before t2, CNT3 is H level regularly, and becomes that the AND gate 13 opened with as at this time, and the same signal as CLYI is sent out to CLY as it is. PDY is also H level regularly before t2, each output of Y driver outputs selection voltage one by one, and the full screen is in the display state. While CLY corresponding to - of 33 lines 200 lines which is a non-display portion stops in a sector display state, it is made for CNT3 and PDY to serve as a signal of timing like drawing 6 so that selection voltage may not output from Y driver.

[0044] Since the period of CLY is not changed in a sector display state, time to impress selection voltage to the scanning electrode of a viewing area is the same as the time of a full screen display. There is also no need of changing a bias ratio and selection voltage.

[0045] When a display panel is an active matrix method, a non-choosing period needs to write OFF state voltage in the pixel of a undisplayed line, in case it shifts to sector display, in order to continue holding the voltage of the pixel section. VCT of drawing is a signal-level control signal, and if VCT is made into L level, it will presuppose that it is the signal which can set the write-in signal level to a pixel to 0V mostly. For example, if the same voltage as common potential is written in in the case of the TFT panel, the write-in signal level to a pixel can be mostly set to 0V. While CNT3 and PDY consider as H level and the undisplayed line is chosen, simultaneously 0V are written in a pixel, so that neither CLY nor selection voltage impression may stop only the period of F1 in the case of an active matrix method, and while stopping CLY corresponding to a non-display portion, it is made for selection voltage not to output from Y driver after F2. In the case of a simple matrix method, each frame after t2 is good at the repeat of the same timing signal.

[0046] Sector display called the direction where the partition of a viewing area and a non-display field is classified by the scanning electrode like drawing 1 B by the above method is made. According to this example, it is made to correspond to the value which sets the size of sector display as a register, and, in a line sequential drive, in a multi-line simultaneous selection drive, one line can carry out adjustable at a time freely per one line in the unit of the line count which carries out simultaneous selection.

[0047] In addition, it is more desirable to also stop CLY like this example, although sector display can also stop impression of selection voltage in the state of sector display as for CLY corresponding to a non-display portion, without stopping in respect of low-power-izing. When stopping CLY at the time of sector display using Y driver by which the interior is not reset by FRM, when shifting to a full-screen-display state from a sector display state, in order to avoid an unusual display, as for 1 inter-frame, it is desirable to stop impression of selection voltage.

[0048] Although the method described above is an example in case the sector display section begins from the head line of a display panel, if it enables it to set the value corresponding to the initial line and end line of the sector display section for a register as 2 system successive installation **** of each, not only the size of the line writing direction of the sector display section but a position can be set up freely. However, the period corresponding to the non-display section from the head line of a display panel to before the initial line of the sector display section needs to operate CLY in this case.

[0049] Moreover, if an example 1 and an example 2 are combined, when each register will be one sequence, sector display like drawing 1 C becomes possible, and when each registers are two sequences,

sector display like drawing 1 D becomes possible.

[0050] (Example 3) Next, the electronic equipment carrying the liquid crystal equipment of this invention is explained below.

[0051] The electronic equipment constituted using the liquid crystal display of an above-mentioned example is constituted including the display panels 1006, such as the source 1000 of a display information output shown in drawing 9, the display information processing circuit 1002, the display drive circuit 1004, and a liquid crystal panel, the clock generation circuit 1008, and a power circuit 1010. The source 1000 of a display information output is constituted including the tuning circuit which aligns and outputs memory, such as ROM and RAM, and a television signal, and outputs display information, such as a video signal, based on the clock from the clock generation circuit 1008. The display information processing circuit 1002 processes and outputs display information based on the clock from the clock generation circuit 1008. This display information processing circuit 1002 can contain for example, amplification / inversion circuit, a phase expansion circuit, a rotation circuit, a gamma correction circuit, or a clamping circuit. The display drive circuit 1004 is constituted including a scan side drive circuit and a data side drive circuit, and carries out the display drive of the liquid crystal panel 1006. A power circuit 1010 supplies power to each above-mentioned circuit.

[0052] The equipment equipped with the video tape recorder of the personal computer dealing with multimedia (PC) and engineering workstation (EWS) which are shown in the liquid crystal projector shown in drawing 10 and drawing 11, the pager shown in drawing 12 or a cellular phone, a word processor, television, a viewfinder type, or a monitor direct viewing type, an electronic notebook, an electronic calculator, car navigation equipment, the POS terminal, and the touch panel as electronic equipment of such composition can be mentioned.

[0053] Drawing 10 is the outline block diagram showing the important section of projected type display. the inside of drawing, and 10 -- the light source, and 13 and 14 -- a liquid crystal light valve and 25 show a cross dichroic prism, and, in a relay lens, and 22, 23 and 24, 26 shows [a reflective mirror, and 18, 19 and 20 / a dichroic mirror, and 15 16 and 17] a projection lens The light source 10 consists of a reflector 12 which reflects the light of the lamps 11, such as metal halide, and a lamp. The dichroic mirror 13 of a blue glow and green light reflection reflects a blue glow and green light while making the red light of the white flux of lights from the light source 10 penetrate. It is reflected by the reflective mirror 17 and incidence of the transmitted red light is carried out to the liquid crystal light valve 22 for red light. On the other hand, among the colored light reflected with the dichroic mirror 13, it is reflected by the dichroic mirror 14 of green light reflection, and incidence of the green light is carried out to the liquid crystal light valve 23 for green light. On the other hand, a blue glow also penetrates the 2nd dichroic mirror 14. In order to prevent the optical loss by the long optical path to a blue glow, the light guide means 21 which consists of a relay lens system containing the incidence lens 18, a relay lens 19, and the outgoing radiation lens 20 is established, and incidence of the blue glow is carried out to the liquid crystal light valve 24 for blue glows through this. Incidence of the three colored light modulated by each light valve is carried out to the cross dichroic prism 25. As for this prism, the dielectric multilayer in which four rectangular prisms reflect the dielectric multilayer which is stuck and reflects red sunset in the inside, and a blue light is formed in the shape of a cross joint. Three colored light is compounded by these dielectric multilayers, and the light showing a color picture is formed. With the projection lens 26 which is projection optical system, the compounded light is projected on a screen 27, and a picture is expanded and it is displayed.

[0054] The personal computer 1200 shown in drawing 11 has this soma 1204 equipped with the keyboard 1202, and the liquid crystal display screen 1206.

[0055] The pager 1300 shown in drawing 12 has the liquid crystal display substrate 1304, the light guide 1306 equipped with back light 1306a, the circuit board 1308, the 1st, the 2nd shield board 1310, 1312 or 2 elastic conductors 1314 and 1316, and the tape carrier package tape 1318 in the metal frame 1302. Two elastic conductors 1314 and 1316 and the tape carrier package tape 1318 connect the liquid crystal display substrate 1304 and the circuit board 1308.

[0056] Here, the liquid crystal display substrate 1304 is what enclosed liquid crystal between two

transparent substrates 1304a and 1304b, and a dot-matrix type liquid crystal display panel is constituted thereby at least. In addition to the drive circuit 1004 shown in drawing 9, or this, the display information processing circuit 1002 can be formed in one transparent substrate. The circuit which is not carried in the liquid crystal display substrate 1304 is made into the external circuit of a liquid crystal display substrate, and, in the case of drawing 12, can be carried at the circuit board 1308.

[0057] Since drawing 12 shows the composition of a pager, although the circuit board 1308 is needed in addition to liquid crystal display substrate 1304, it is the case where a liquid crystal display is used as elegance for electronic equipment a part, and when a display drive circuit etc. is carried in a transparent substrate, the smallest unit of the liquid crystal display is the liquid crystal display substrate 1304. Or what fixed the liquid crystal display substrate 1304 to the metal frame 1302 as a housing can also be used as a liquid crystal display for electronic equipment which is elegance a part. Furthermore, in the case of a back light formula, in the metal frame 1302, the liquid crystal display substrate 1304 and the light guide 1306 equipped with back light 1306a can be incorporated, and a liquid crystal display can be constituted. As it replaces with these and is shown in drawing 13, TCP (Tape Carrier Package)1320 which mounted the IC chip 1324 can be connected to the polyimide tape 1322 on which the metaled electric conduction film was formed in one side of two transparent substrates 1304a and 1304b which constitute the liquid crystal display substrate 1304, and it can also be used as a liquid crystal display for electronic equipment which is elegance a part.

[0058] In addition, this invention is not limited to the above-mentioned example, and deformation implementation various by within the limits of the summary of this invention is possible for it. For example, this invention is applicable not only to what is applied to the drive of various kinds of above-mentioned liquid crystal panels but electroluminescence and plasma display equipment.

[0059]

[Effect of the Invention] According to this invention, since an equipment user can set up the required size and required position of a sector display field with a register, the high liquid crystal equipment of versatility can be offered.

[Translation done.]